

GEA Pharma Systems India



MP-1 Fluid Bed Multi-Processor™ - batch sizes 200g - 6kg

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Multi-Processor Concept

The MULTI-PROCESSOR™ has been developed by Aeromatic-Fielder to meet the industry's requirements for flexibility in unit operations and is based on the principle that one basic unit can be used for numerous processes simply by interchanging a module.

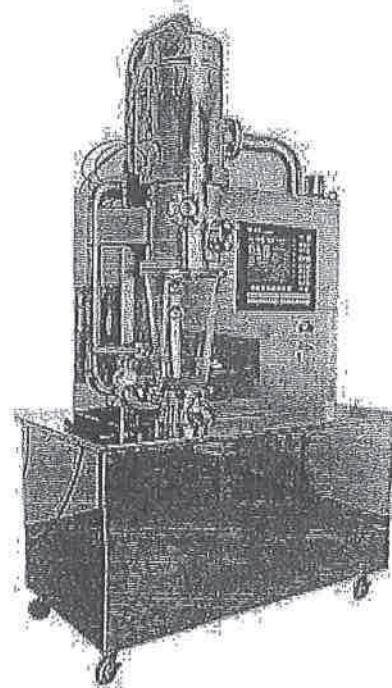
- The Drying module
- The Top Spray Granulation module
- The Spray Dryer Granulator module
- The PRECISION-GRANULATOR™ module
- The PRECISION-COATER™ module

The concept is available in sizes ranging from the MP-1 lab unit up to full production scale equipment built in compliance with current GMP and safety standards. Only the highest qualities of materials are used to build the MULTI-PROCESSOR™ giving you a long lasting and reliable unit for your process work.

MP-1 Fluid Bed Processor

Features:

- Self-contained control unit
- PLC control system with Siematic S7
- Local operator interface terminal
- Automatic recipe control function
- Data- capture equipment



Size		12 litre bowl	16 litre bowl
Drying	kg	0.2 - 2	1 - 6 *
Top Spray Granulation	kg	0.2 - 1	1 - 3 *
Spray Dryer Granulation	kg	0.2 - 1	1 - 6 *
PRECISION-COATER™	kg	0.2 - 1	1 - 6 **

* Products with bulk density of 0.5gms/cm³

** Products with bulk density of 0.8gms/cm³

Options for Special Applications

The standard MP-1 is equipped to carry out the majority of every day processing. However, to meet special customer requirements a range of options is available.

- Reduced volume containers
- Selection of air distributors
- Hinged expansion piece
- Product agitator
- Powder injector system
- HEPA filtration of inlet air
- Dehumidification of inlet air
- Humidification of inlet air
- Steam or ceramic heater
- Closed cycle operation
- Solvent recovery system
- Selection of filter materials
- Police filters
- Built-in fan ("Compact Design")
- Noise attenuator (silencer)
- Screen based control panel

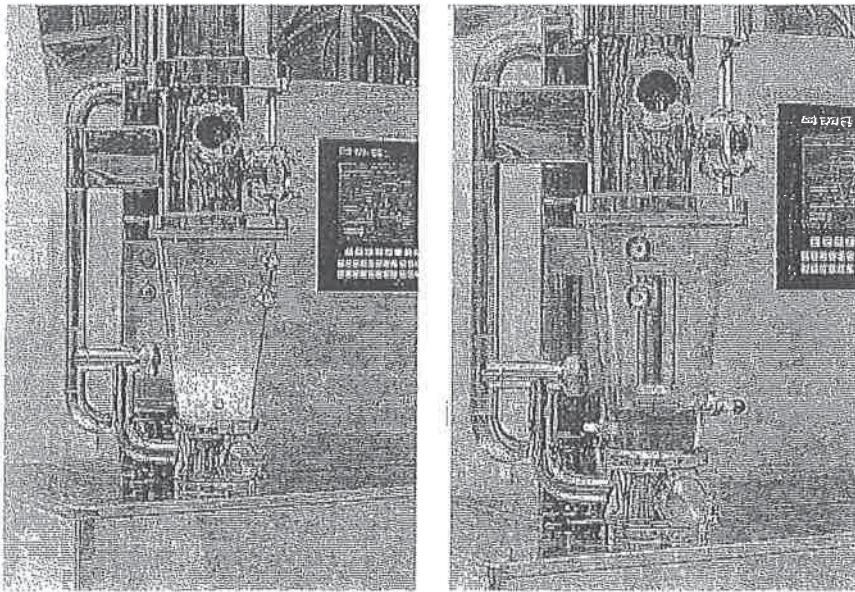
- Expanded control packages
- Data logging
- Recipe handling
- Explosion-proof controls
- 10 bar pressure shock resistant design

Easy Scale-Up

All process can be carried out also in large scale MULTI-PROCESSOR™.

With the MULTI-PROCESSOR™ concept maximum flexibility is achieved because the function of the equipment can be changed at a later date by simply using another module.

If the high flexibility of the Multi-Processors is not required, large scale plants can also be built as dedicated production units using Aeromatic-Fielder's "Building Block System".



Technical Data

Standard 16 ltr Product Container	Min. batch weight	350 g
	Max. batch weight	6.0 kg
Standard 12 ltr Product Container	Min. batch weight	200 g
	Max. batch weight	4.5 kg
Peristaltic pump	Throughput rate	300 ml / min
Customer Supply	Europe	3 x 380 v
	USA	3 x 480 v
Electrical data	Europe	50 Hz
	USA	60 Hz
	Electrical power (max.)	18 kW
	Electrical heater	13.5 kW
	Compressed air	6 barg
Weight (approx.)		850 kg
Dimensions (L x W x H)		1700 x 1000 x 2800 mm



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Emissions Information Application

If you are using this form electronically, press F1 at any time for help

<u>Process Information</u>					
1.	Number of Individual Pieces of Process Equipment in Process:	1 - MP-1			
2.	Number of Individual Control Devices in Process:	1 - Carbon Beds			
<u>Emissions Information for First Emission Point/Stack</u>					
3.	Emission Point Name:	MP-1			
4.	Equipment ID Number for all Process Equipment and Control Devices Venting Through Emission Point/Stack:	MP-1			
5.	Pollutant Emissions				
If more than 15 pollutants are emitted at this Emission Point/Stack, attach additional copies of this page as needed.					
Pollutant Name (Specify VOCs and HAPs Individually in 5.10 through 5.18)	CAS Number (Not required for 5.1 through 5.10)	Maximum Uncontrolled Emission Rate at Design Capacity	Maximum Controlled Emission Rate at Design Capacity	Annual Potential to Emit (PTE)	Requested Permitted Annual Emissions
5.1. Particulate Matter (PM)		0 lbs/hour	lbs/hour	tons/year	tons/year
5.2. PM ₁₀		0 lbs/hour	lbs/hour	tons/year	tons/year
5.3. PM _{2.5}		0 lbs/hour	lbs/hour	tons/year	tons/year
5.4. Sulfur Oxides (SO _x)		0 lbs/hour	lbs/hour	tons/year	tons/year
5.5. Nitrogen Oxides (NO _x)		0 lbs/hour	lbs/hour	tons/year	tons/year
5.6. Carbon Monoxide (CO)		0 lbs/hour	lbs/hour	tons/year	tons/year
5.7. Total Volatile Organic Compounds (VOCs)		2.09 lbs/hour	0.209 lbs/hour	2.67 tons/year	0.267 tons/year
5.8. Total Hazardous Air Pollutants (HAPs)		0 lbs/hour	0 lbs/hour	0 tons/year	0 tons/year



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Emissions Information for First Emission Point/Stack					
5.9.	CO ₂	0 lbs/hour	lbs/hour	tons/year	tons/year
5.10.	CO _{2e}	0 lbs/hour	lbs/hour	tons/year	tons/year
5.11.		lbs/hour	lbs/hour	tons/year	tons/year
5.12.		lbs/hour	lbs/hour	tons/year	tons/year
5.13.		lbs/hour	lbs/hour	tons/year	tons/year
5.14.		lbs/hour	lbs/hour	tons/year	tons/year
5.15.		lbs/hour	lbs/hour	tons/year	tons/year
6.	Provide Any Additional Information Necessary to Understanding the Emission Rates Provided Above:				
Attach the Basis of Determination or Calculations for each Emission Rate provided above.					
Emissions Information for Second Emission Point/Stack					
7.	Emission Point Name:				
8.	Equipment ID Number for all Process Equipment and Control Devices Venting Through Emission Point/Stack:				
9.	Pollutant Emissions				
If more than 15 pollutants are emitted at this Emission Point/Stack, attach additional copies of this page as needed.					
Pollutant Name (Specify VOCs and HAPs Individually in 9.10 through 9.18)	CAS Number (Not required for 9.1 through 9.10)	Maximum Uncontrolled Emission Rate at Design Capacity	Maximum Controlled Emission Rate at Design Capacity	Annual Potential to Emit (PTE)	Requested Permitted Annual Emissions
9.1. Particulate Matter (PM)		lbs/hour	lbs/hour	tons/year	tons/year
9.2. PM ₁₀		lbs/hour	lbs/hour	tons/year	tons/year
9.3. PM _{2.5}		lbs/hour	lbs/hour	tons/year	tons/year



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Emissions Information for Second Emission Point/Stack					
		lbs/hour	lbs/hour	tons/year	tons/year
9.4.	Sulfur Oxides (SO _x)				
9.5.	Nitrogen Oxides (NO _x)				
9.6.	Carbon Monoxide (CO)				
9.7.	Total Volatile Organic Compounds (VOCs)				
9.8.	Total Hazardous Air Pollutants (HAPs)				
9.9.	CO ₂				
9.10.	CO _{2e}				
9.11.					
9.12.					
9.13.					
9.14.					
9.15.					
10.	Provide Any Additional Information Necessary to Understanding the Emission Rates Provided Above:				
Attach the Basis of Determination or Calculations for each Emission Rate provided above.					
Emissions Information for Third Emission Point/Stack					
11.	Emission Point Name:				
12.	Equipment ID Number for all Process Equipment and Control Devices Venting Through Emission Point/Stack:				
13.	Pollutant Emissions				
If more than 15 pollutants are emitted at this Emission Point/Stack, attach additional copies of this page as needed.					



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Emissions Information for Third Emission Point/Stack					
Pollutant Name (Specify VOCs and HAPs Individually in 13.10 through 13.18)	CAS Number (Not required for 13.1 through 13.10)	Maximum Uncontrolled Emission Rate at Design Capacity	Maximum Controlled Emission Rate at Design Capacity	Annual Potential to Emit (PTE)	Requested Permitted Annual Emissions
13.1. Particulate Matter (PM)		lbs/hour	lbs/hour	tons/year	tons/year
13.2. PM ₁₀		lbs/hour	lbs/hour	tons/year	tons/year
13.3. PM _{2.5}		lbs/hour	lbs/hour	tons/year	tons/year
13.4. Sulfur Oxides (SO _X)		lbs/hour	lbs/hour	tons/year	tons/year
13.5. Nitrogen Oxides (NO _X)		lbs/hour	lbs/hour	tons/year	tons/year
13.6. Carbon Monoxide (CO)		lbs/hour	lbs/hour	tons/year	tons/year
13.7. Total Volatile Organic Compounds (VOCs)		lbs/hour	lbs/hour	tons/year	tons/year
13.8. Total Hazardous Air Pollutants (HAPs)		lbs/hour	lbs/hour	tons/year	tons/year
13.9. CO ₂		lbs/hour	lbs/hour	tons/year	tons/year
13.10. CO _{2e}		lbs/hour	lbs/hour	tons/year	tons/year
13.11.		lbs/hour	lbs/hour	tons/year	tons/year
13.12.		lbs/hour	lbs/hour	tons/year	tons/year
13.13.		lbs/hour	lbs/hour	tons/year	tons/year
13.14.		lbs/hour	lbs/hour	tons/year	tons/year
13.15.		lbs/hour	lbs/hour	tons/year	tons/year
14. Provide Any Additional Information Necessary to Understanding the Emission Rates Provided Above:					
Attach the Basis of Determination or Calculations for each Emission Rate provided above.					



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Emissions Information for Fourth Emission Point/Stack

15. Emission Point Name:

16. Equipment ID Number for all Process Equipment and Control Devices Venting Through Emission Point/Stack:

17. Pollutant Emissions

If more than 15 pollutants are emitted at this Emission Point/Stack, attach additional copies of this page as needed.

Pollutant Name (Specify VOCs and HAPs Individually in 17.10 through 17.18)	CAS Number (Not required for 17.1 through 17.10)	Maximum Uncontrolled Emission Rate at Design Capacity	Maximum Controlled Emission Rate at Design Capacity	Annual Potential to Emit (PTE)	Requested Permitted Annual Emissions
17.1. Particulate Matter (PM)		lbs/hour	lbs/hour	tons/year	tons/year
17.2. PM ₁₀		lbs/hour	lbs/hour	tons/year	tons/year
17.3. PM _{2.5}		lbs/hour	lbs/hour	tons/year	tons/year
17.4. Sulfur Oxides (SO _x)		lbs/hour	lbs/hour	tons/year	tons/year
17.5. Nitrogen Oxides (NO _x)		lbs/hour	lbs/hour	tons/year	tons/year
17.6. Carbon Monoxide (CO)		lbs/hour	lbs/hour	tons/year	tons/year
17.7. Volatile Organic Compounds (VOCs)		lbs/hour	lbs/hour	tons/year	tons/year
17.8. Total Hazardous Air Pollutants (HAPs)		lbs/hour	lbs/hour	tons/year	tons/year
17.9. CO ₂		lbs/hour	lbs/hour	tons/year	tons/year
17.10. CO _{2e}		lbs/hour	lbs/hour	tons/year	tons/year
17.11.		lbs/hour	lbs/hour	tons/year	tons/year
17.12.		lbs/hour	lbs/hour	tons/year	tons/year
17.13.		lbs/hour	lbs/hour	tons/year	tons/year
17.14.		lbs/hour	lbs/hour	tons/year	tons/year
17.15.		lbs/hour	lbs/hour	tons/year	tons/year



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Emissions Information for Fourth Emission Point/Stack

18. Provide Any Additional Information Necessary to Understanding the Emission Rates Provided Above:

Attach the Basis of Determination or Calculations for each Emission Rate provided above.

If there are more than four Emission Points/Stacks, attach additional copies of this form as needed.

Overall Process Emissions

19. Pollutant Emissions

If more than 15 pollutants are emitted from this Process, attach additional copies of this page as needed.

Pollutant Name (Specify VOCs and HAPs Individually in 19.10 through 19.18)	CAS Number (Not required for 19.1 through 19.10)	Maximum Uncontrolled Emission Rate at Design Capacity	Maximum Controlled Emission Rate at Design Capacity	Annual Potential to Emit (PTE)	Requested Permitted Annual Emissions
19.1. Particulate Matter (PM)		lbs/hour	lbs/hour	tons/year	tons/year
19.2. PM ₁₀		lbs/hour	lbs/hour	tons/year	tons/year
19.3. PM _{2.5}		lbs/hour	lbs/hour	tons/year	tons/year
19.4. Sulfur Oxides (SO _x)		lbs/hour	lbs/hour	tons/year	tons/year
19.5. Nitrogen Oxides (NO _x)		lbs/hour	lbs/hour	tons/year	tons/year
19.6. Carbon Monoxide (CO)		lbs/hour	lbs/hour	tons/year	tons/year
19.7. Total Volatile Organic Compounds (VOCs)		2.09 lbs/hour	0.209 lbs/hour	2.67 tons/year	.267 tons/year
19.8. Total Hazardous Air Pollutants (HAPs)		0 lbs/hour	0 lbs/hour	0 tons/year	0 tons/year
19.9. CO ₂		lbs/hour	lbs/hour	tons/year	tons/year
19.10. CO _{2e}		lbs/hour	lbs/hour	tons/year	tons/year
19.12.		lbs/hour	lbs/hour	tons/year	tons/year



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Overall Process Emissions					
		Ibs/hour	Ibs/hour	Ibs/hour	Ibs/hour
19.13.					
19.14.					
19.15.					
20.	Provide Any Additional Information Necessary to Understanding the Emission Rates Provided Above:				

Attach the Basis of Determination or Calculations for each Emission Rate provided above.

Minor New Source Review Information	
21.	Does the Process Have the Potential to Emit More Than Five Tons Per Year of Any Pollutant? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
22.	Is the Source New or Existing? <input checked="" type="checkbox"/> NEW <input type="checkbox"/> EXISTING See Question 11 of AQM-1
If the Process has the Potential to Emit more than five tons per year of any pollutant, and is a New Source, a Control Technology Analysis pursuant to Regulation No. 1125 Section 4 must be conducted and attached to this application.	

Major New Source Review Information	
23.	Does the Process Have the Potential to Emit More Than the Significance Level for Any Pollutant? (Check All That Apply)
	<input type="checkbox"/> Greater Than 25 Tons Per Year of Particulate Matter (PM)
	<input type="checkbox"/> Greater Than 15 Tons Per Year of PM ₁₀
	<input type="checkbox"/> Greater Than 10 Tons Per Year of PM _{2.5}
	<input type="checkbox"/> Greater Than 40 Tons Per Year of Sulfur Dioxide(SO ₂)
	<input type="checkbox"/> Greater Than 25 Tons Per Year of Nitrogen Oxides (NO _x) in New Castle and Kent County
	<input type="checkbox"/> Greater Than 100 Tons Per Year of Nitrogen Oxides (NO _x) in Sussex County
	<input type="checkbox"/> Greater Than 100 Tons Per Year of Carbon Monoxide (CO)
	<input type="checkbox"/> Greater Than 25 Tons Per Year of Total Volatile Organic Compounds (VOCS) in New Castle and Kent County
	<input type="checkbox"/> Greater Than 50 Tons Per Year of Total Volatile Organic Compounds (VOCS) in Sussex County
	<input type="checkbox"/> Greater Than 75,000 Tons Per Year of Equivalent Carbon Dioxide (CO _{2e})



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If the Process has the Potential to Emit greater than any of the amounts listed above 7 DE Admin. Code 1125 Sections 2 and/or 3 apply. Contact the Department at (302) 323-4542 or (302) 739-9402 for additional information

Additional Information

24. Is There Any Additional Information Pertinent to this Application? YES NO

If YES, complete the rest of Question 24.

- 24.1. Describe:

Maximum Emissions Calculations, MP1 - Updated 04/25/16, Reviewed 5/17/2016						
Run rate ⁽¹⁾	1 kg/hr	Run Time ⁽²⁾	10.0 hr/day	Operating Days/yr ⁽⁴⁾	255.5 days/yr	Solvent Used ⁽³⁾
Solvent Spray Dried	2555 kg/yr	Operating Hours	2,555 hr/yr	Maximum kg/yr exhausted	Maximum lb/hr exhausted	Maximum tons/year exhausted
Solvent Mix	%					
Ethanol	75.0%	1916.25	1,650	2,108	0.165	100%
Methanol	0.0%	0	0.000	0	0	0%
IPA	20.0%	511	0.440	0.562	0.044	100%
Ethy Acetate	0.0%	0	0.000	0	0	0%
Methylene Chloride	0.0%	0	0.000	0	0	0%
THF	0.0%	0	0.000	0	0	0%
Acetone	5.0%	127.75	0.110	0.141	0.011	100%
	100%	2555	2.200	2.811		
				*1 kg = 2.2 lb		
NOTES:						
(1) Based on equipment design, the max run rate cannot exceed 1 kg/hr						
(2) The equipment runs in batches, max 3 batches per day. In between batches the time for disassembly, cleaning, drying and assembly will take at least 14 hours. The max running time per batch per day is thus 24h minus 14 hours = 10 hours						
(3) This is total maximum Kg = solvent + solids. To be conservative, consider it all solvent and do not adjust out the solids weight.						
(4) Approximately 30% of the time throughout the year between batches, the granulator is also not running because the resulted material needs to be characterized for particle size, particle size distribution, density, solvent content and morphology. The max running days is thus calculated as follows: (365 days)*(100%-30%)=255.5 days						
(5) Decision made to vent MP-1 to carbon beds						

Expected Emissions Calculations, MP1 - Updated 04/25/2016, Reviewed 5/17/2016						
Run rate ⁽¹⁾		1 kg/hr				
Run Time ⁽²⁾	4.0 hr/day					
Solvent Used ⁽³⁾	4 kg/day					
Operating Days/yr ⁽⁴⁾	182.5 days/yr					
Solvent Spray Dried						
Operating Hours	730 hr/yr					
Solvent Mix	% exhausted	Maximum kg/yr exhausted	Maximum lb/hr exhausted	Maximum tons/year exhausted	Maximum lb/hr After Carbon Beds ⁽⁵⁾	Maximum kg/yr exhausted
Ethanol	75.0%	547.5	1,650	0.602	0.165	100%
Methanol	0.0%	0	0.000	0.000	0	0%
IPA	20.0%	146	0.440	0.161	0.044	100%
Ethy Acetate	0.0%	0	0.000	0.000	0	100%
Methylene Chloride	0.0%	0	0.000	0.000	0	0%
THF	0.0%	0	0.000	0.000	0	0%
Acetone	5.0%	36.5	0.110	0.040	0.011	0%
	100%	730	2,200	0.803		
NOTES:		*1 kg = 2.2 lb				
(1) Based on equipment design, the max run rate cannot exceed 1 kg/hr						
(2) The equipment runs in batches, typically we run 2 batches a day, less than 2 hours per batch						
(3) This is total maximum Kg = solvent + solids. To be conservative, consider it all solvent and do not adjust out the solids weight.						
(4) In a typical year, the granulator is operated less than 50% of the days throughout the year						
(5) Decision made to vent MP-1 to carbon beds						

Summary

MP-1		Potential To Emit			Expected Emission			Permit Limits	
<u>Pollutant</u>	<u>VOC?</u>	<u>HAP?</u>	<u>Maximum Uncontrolled Emission Rate lb/hr⁽¹⁾</u>	<u>Maximum Controlled Emission Rate lb/hr^{(1) (2)}</u>	<u>Annual Potential To Emit (PTE) (tons/yr)⁽¹⁾</u>	<u>Expected Annual Uncontrolled Emissions (tons/yr)</u>	<u>Expected Annual Controlled Emissions (tons/yr) (2)</u>	<u>Emissions (lb/hr) after Carbon Beds</u>	<u>Annual Emissions as a 12 month rolling period (TPY)</u>
Ethanol	Yes	No	1.650	0.165	2.108	0.602	0.060	0.22	0.211
Methanol	Yes	Yes	0.000	0.000	0.000	0.000	0.000	0	0.000
IPA	Yes	No	0.440	0.044	0.562	0.161	0.016	0.22	0.056
Ethyl Acetate	Yes	No	0.000	0.000	0.000	0.000	0.000	0.22	0.000
Methylene Chloride	No	Yes	0.000	0.000	0.000	0.000	0.000	0	0.000
Tetrahydrofuran	Yes	No	0.000	0.000	0.000	0.000	0.000	0	0.000
Acetone	No	No	0.110	0.011	0.141	0.040	0.004	0	0.014
VOC			2.09	0.21	2.67	0.76	0.08	NA	0.267
HAP			0.00	0.00	0.00	0.00	0.00	NA	0.000
<u>Notes:</u>									
(1) Acetone, as defined by the US EPA, is neither a VOC nor a HAP, and the totals are not included in the VOC or HAP totals.									
(2) The controlled emissions assume a carbon adsorption control efficiency of 90%. There are two carbon canisters operating in series, so the actual control efficiency will be greater than 90%.									

Notes:

- (1) Acetone, as defined by the US EPA, is neither a VOC nor a HAP, and the totals are not included in the VOC or HAP totals.
- (2) The controlled emissions assume a carbon adsorption control efficiency of 90%. There are two carbon canisters operating in series, so the actual control efficiency will be greater than 90%.

Carbon Bed Adsorbers



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Adsorption Equipment Application

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General Information

1. Facility Name: **Hercules / Ashland Research Center**

2. Equipment ID Number: **Carbon Beds**

3. Manufacturer: **Envirotrol**

4. Model: **VPM-2000**

5. Serial Number:

Attach the Manufacturer's Specification Sheet for the Adsorption Equipment.

Adsorbent Information

6. Describe Adsorbent Type and Physical Properties: Activated carbon

7. Breakthrough Capacity (pounds contaminant/100 pounds adsorbent):

8. Operating Temperature Range of Adsorbent: from °F to °F

9. Life Expectancy of Adsorbent:

10. Provide Any Necessary Additional Information Regarding the Adsorbent: **See equipment specifications included at the end of the AQM-4.2 application.**

Adsorber Bed Information

11. Adsorbent Charge per Adsorber Vessel: **2000**

12. Number of Adsorber Vessels: **2**

13. Configuration of Adsorber Vessels: Series Parallel Other (Specify):

14. Length of Mass Transfer Zone: **feet**

Attach Basis of Design for the Length of the Mass Transfer Zone calculation.

15. Adsorber Bed Cross Sectional Area: **square feet**

16. Adsorption Bed Depth: **feet**

17. Working Capacity of Adsorbent: **%**



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Regeneration Information

18. Is the Adsorbent Regenerated? YES NO

If the Adsorbent is Regenerated, complete the rest of Question 18. If not, proceed to Question 19.

- 18.1. Predicted Regeneration Cycle: **See equipment specifications included at the end of the AQM-4.2 application.**

- 18.2. Describe Regeneration Trigger: **When solvent load reaches 250 kg (85% of design capacity - solvent usage log is kept)**

- 18.3. Predicted Number of Times Adsorbent Will be Regenerated Before Replacement:

- 18.4. Regeneration Location: On-Site Off-Site

If Regeneration is conducted On-Site, complete the rest of Question 18. If it is conducted Off Site, proceed to Question 19.

- 18.5. Type of Regeneration: Steam Electric Hot Air Other (Specify):

If Steam Regeneration is used, complete the rest of Question 18. If not, proceed to Question 19.

- 18.6. Available Steam for Regeneration: **pounds of steam**

- 18.7. Describe How the Regeneration Liquid is Treated or Disposed Of:

Gas Stream Information

19. Maximum Inlet Volumetric Gas Flow Rate: **50 acfm at °F and % moisture**

20. Maximum Outlet Volumetric Gas Flow Rate: **50 acfm at °F and % moisture**

21. Design Range of Pressure Drop Across Bed: **inches water**

22. Residence Time: **2.7 minutes**

Contaminant Information

23. Will Heat of Adsorption Potentially Lead to Temperature Excursions? YES NO

If Yes, Complete the Rest of Question 23, If No, Proceed to Question 24.

- 23.1. Describe How Temperature Excursions Will Be Handled:

24. Percent Relative Saturation, Vapor Pressure at the Inlet Temperature, and Removal Efficiency of Each Contaminant

If more than five Contaminants will be removed, attach additional copies of this page as needed.

Contaminant Name	CAS Number	Percent Relative Saturation	Vapor Pressure	Removal Efficiency
24.1. Methylene Chloride	75-09-2	0.72	349 mm mercury	90 %



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<u>Contaminant Information</u>					
24.2.	Acetone	67-64-1	0.39	180 mm mercury	90 %
24.3.	Methanol	67-56-1	128	16.8 mm mercury	90 %
24.4.	Ethanol	64-17-5	59	7.8 mm mercury	90 %
24.5.	Isopropanol	67-63-0	33	4.3 mm mercury	90 %

<u>Stack Information</u>					
25.	Emission Point Name:	Carbon Beds			
25.1.	Stack Height Above Grade:	>32 feet			
25.2.	Stack Exit Diameter:	0.66 feet (Provide Stack Dimensions If Rectangular Stack)			
25.3.	Is a Stack Cap Present?	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO			
25.4.	Stack Configuration:	<input checked="" type="checkbox"/> Vertical <input type="checkbox"/> Horizontal <input checked="" type="checkbox"/> Downward-Venting (check all that apply) <input type="checkbox"/> Other (Specify): Vertical capped stack or goose neck stack down			
25.5.	Stack Exit Gas Temperature:	25 °F			
25.6.	Stack Exit Gas Flow Rate:	50 ACFM			
25.7.	Distance to Nearest Property Line:	341 feet			
25.8.	Describe Nearest Obstruction:	Building 8162			
25.9.	Height of Nearest Obstruction:	32 feet			
25.10.	Distance to Nearest Obstruction:	about 10 feet			
25.11.	Are Stack Sampling Ports Provided?	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO			

<u>Monitoring and Alarm Information</u>				
26.	Are There Any Alarms You Would Like the Department to Consider When Drafting the Permit?		<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	
<i>If YES, complete the rest of Question 26. If NO, proceed to Question 27.</i>				
26.1.	Describe the System Alarm(s):			
<i>If there are more than five alarms, attach additional copies of this page as needed.</i>				
	Operating Parameter Monitored	Describe Alarm Trigger	Monitoring Device or Alarm Type	Does the Alarm Initiate an Automated Response?
26.1.1.			<input type="checkbox"/> Visual	<input type="checkbox"/> NO <input type="checkbox"/> YES



**DNREC – Division of Air Quality
Application to Construct, Operate, or Modify
Stationary Sources**

Form AQM-4.2
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<u>Monitoring and Alarm Information</u>				
		<input type="checkbox"/> Auditory <input type="checkbox"/> Automatic (Remote Monitoring) <input type="checkbox"/> Other	Describe:	
26.1.2.		<input type="checkbox"/> Visual <input type="checkbox"/> Auditory <input type="checkbox"/> Automatic (Remote Monitoring) <input type="checkbox"/> Other	<input type="checkbox"/> NO	<input type="checkbox"/> YES Describe:
26.1.3.		<input type="checkbox"/> Visual <input type="checkbox"/> Auditory <input type="checkbox"/> Automatic (Remote Monitoring) <input type="checkbox"/> Other	<input type="checkbox"/> NO	<input type="checkbox"/> YES Describe:
26.1.4.		<input type="checkbox"/> Visual <input type="checkbox"/> Auditory <input type="checkbox"/> Automatic (Remote Monitoring) <input type="checkbox"/> Other	<input type="checkbox"/> NO	<input type="checkbox"/> YES Describe:
26.1.5.		<input type="checkbox"/> Visual <input type="checkbox"/> Auditory <input type="checkbox"/> Automatic (Remote Monitoring) <input type="checkbox"/> Other	<input type="checkbox"/> NO	<input type="checkbox"/> YES Describe:

<u>Additional Information</u>				
27. Is There Any Additional Information Pertinent to this Application? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO				
If YES, complete the rest of Question 27.				



**DNREC – Division of Air Quality
Application to Construct, Operate, or Modify
Stationary Sources**

Form AQM-4.2
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Additional Information

- 27.1. Describe: Update to the weekly check to be performed between the two carbon beds when the spray dryer or fluid bed dryer process is operating. Affected carbon beds will be changed when breakthrough is detected:

Detection Methods:

1. A soapy water solution will be prepared
2. Airflow will be introduced to the carbon bed absorber system by turning the carbon bed nitrogen supply valve to the OPEN position.
3. The soapy water solution will be applied with a spray bottle to all fittings, connections, and areas sealed with gaskets.
4. The solution will be applied starting at:
 - 4.1 The connection between the wall outlet pipe and the hose to the carbon bed.
 - 4.2 The connection between the hose and the first carbon bed
 - 4.3 The area around the temperature probe on the first carbon bed
 - 4.4 The area around the entry hatch on the first carbon bed
 - 4.5 The connection between the first carbon bed and the second hose
 - 4.6 The connection between the second hose and the second carbon bed
 - 4.7 The area around the vent on the second carbon bed
 - 4.8 The area around the hatch on the second carbon bed
5. The process will be repeated for the second set of carbon beds
6. A handheld oxygen monitor will be used during this process to detect major leaks of nitrogen



STANDARD OPERATING PROCEDURE

Title: Use of Carbon Bed Adsorbers	Doc No.: MF-086	Edition: 003
	Effective Date: 02/07/11 REV: 02/07/11	Page: 1 of 10

SIGNATURE BLOCK		
Signatory	Signature	Date
Submitted by		02/07/11
Operations Approval		01/07/11
Quality Assurance Approval		01/12/11

1. Purpose

This procedure describes the assembly for proper venting and the use of carbon bed adsorbers to remove solvents from the vent stream of a spray dryer, the disposition of the spent beds as hazardous waste, and the documentation required to comply with applicable regulatory agencies.

2. Responsibility

- 2.1 Operations, Development Services, Warehouse, and Engineering and Maintenance (E & M) personnel shall be responsible for following these procedures.
- 2.2 Project Leaders shall maintain and oversee the procedures to assure that they meet the requirements for compliance with environmental regulations.

3. Definitions/Abbreviations

- 3.1 Warehouse personnel: individual's trained on the appropriate warehouse Standard Operating Procedures (SOPs).
- 3.2 PPE: Personal Protective Equipment
- 3.3 MSDS: material safety data sheet
- 3.4 PSD2: Closed Cycle Utility Spray Dryer (SN 531000)
- 3.5 PSD1: Portable Spray Dryer (SN 093-1993-00)
- 3.6 Carbon bed adsorber: prefabricated vessels filled with carbon designed to remove solvents from the process gas.



STANDARD OPERATING PROCEDURE

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4. Related Documents

- 4.1 SOP MF-082 [*Closed Cycle Utility Spray Dryer (SN 531000): Set-up, Operation, and Cleaning*]
- 4.2 SOP MF-110 [*PSD1 Spray Dryer with Baghouse/Carbon Bed (SN 093-1993-00): Set-up, Operation, and Cleaning*]
- 4.3 SOP SF-005 (*Hazardous Waste Management*)
- 4.4 Form MF-086.1: Carbon Bed Usage Log

5. Required Materials

- 5.1 Appropriate PPE
- 5.2 Forklift, appropriately rated for weight of carbon bed
- 5.3 Ladder
- 5.4 Appropriate wrenches

6. Safety Considerations

- 6.1 Disassembly will entail potential exposure to nitrogen, solvents, and concentrated solvent vapors. Personnel performing these procedures should be familiar with the applicable MSDS for each solvent and the activated carbon.
- 6.2 Appropriate PPE should be used as indicated.
- 6.3 Low oxygen levels may exist in the carbon vessels because of the reaction with water in the air. This may deplete oxygen even without the use of nitrogen. Do not access the vessels unless necessary and then first check for O₂ to be at least 19.7%. Entry to the vessel should be avoided, however, if entry becomes necessary a Confined Space Entry Permit shall be required.
- 6.4 Solvents may be flammable and may cause explosive mixtures in air.

STANDARD OPERATING PROCEDURE

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7. Description of System

- 7.1 For the PSD2, the requirements for venting of what is nominally a closed cycle system is due to the addition of non-condensable or process gas in addition to the closed loop of gas and vapors re-circulating through heating, evaporation, and condensing phases. These added gases may include entrained air in the feed, a small continuous purge of nitrogen, nitrogen for pulsing the baghouse, and atomizing gas (N₂) when two-fluid nozzles are used.
 - 7.1.1 Venting of the gases is provided for in the 'system pressure' control loop of the dryer. This is designed to maintain a constant, small positive pressure in the dryer when in operation. It includes a nitrogen supply and a vent flow control valve. In normal operation, the dryer is continuously venting the excess gases. These gases contain solvent vapor saturated at the exit temperature of the condenser.
 - 7.1.2 The dryer is permitted to vent without emission controls for the small resulting flow and solvent concentration in ethanol based feed streams and the baghouse pulse system under a Maryland Department of the Environment (MDE) permit. Controls are required to accommodate solvents that are more volatile or the large vent flow required when using a two fluid nozzle.
 - 7.1.3 The dryer outlet vent valve is ducted from Room 313 to the carbon beds.
- 7.2 The portable spray dryer (PSD1) is an open cycle dryer. All solvent processed is part of the gas stream that is vented to a carbon bed. It is configured with a small portable carbon bed that is regenerated in-house [refer to SOP MF-110 [PSD1 Spray Dryer with Baghouse/Carbon Bed (SN 093-1993-00): Set-up, Operation, and Cleaning].
 - 7.2.1 The carbon beds stated in this procedure may be used with the portable spray dryer in lieu of the small portable carbon bed.
 - 7.2.2 The baghouse outlet is ducted to the room exhaust vent that can be ducted to the carbon beds. Exhaust venting is available in Rooms 208, 209 and 214.

STANDARD OPERATING PROCEDURE

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- 7.3 The ducting to the beds directs the gas to one carbon bed vessel. The final connection to the beds is by hose and a cam-lock type fitting. Any carbon bed in use is "backed-up" with another carbon bed ducted with hose in series from the outlet of the first to the inlet of the next.
- 7.4 The carbon adsorbs the solvent vapors from the gas stream. So long as the carbon is not saturated, the removal is nearly 100%. The adsorption generates heat. Because the solvent concentration in the vent stream from the PSD2 may be high (5 – 35% solvent), it is necessary to use additional nitrogen to dilute the stream and dissipate heat. This is provided in a hose from the nitrogen delivery system's evaporator located behind the building. It is connected at a T in the inlet to the carbon bed in use. The increased volume also is beneficial in distributing the gas over the full face of the bed.
- 7.5 The carbon beds are to be used in their down flow configuration where the gas enters over the carbon and circulates down to collector piping below the carbon. Both connections are on the top of the vessel, only the collector is piped down into the vessel below the carbon, this is to be the outlet.
- 7.6 The capacity of the carbon beds is variable according to the actual solvent, the concentration of solvent and the temperature of the bed. Refer to the supplier's literature to estimate the capacity at any given condition.

8. Procedure

- 8.1 The Project Leader provides for an adequate number of adsorbers to be available for any processing campaign by requisitioning for the lease of the adsorbers.
- 8.2 Warehouse and E & M personnel shall be notified to expect the delivery of the beds.
- 8.3 Active beds shall be staged near the Pharmaceutical Technology Center (PTC) building with their inlet flanges capped.

STANDARD OPERATING PROCEDURE

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- 8.4 Operations or Development Services personnel shall determine the capacity of carbon required according to the duration of the operation, the atomizing gas rate, and the use history of the carbon beds placed in service. When the process run duration is within the capacity of one adsorber, one set of beds shall be required with a bed having the anticipated capacity in the first position. For operations exceeding the capacity of one bed, two sets of beds shall be installed in parallel to allow changing the vent routing on line. Otherwise, the process shall be shut down to change out the carbon beds.
- 8.5 The use of carbon beds shall be recorded to maintain a means of assessing their capacity and track emissions. Operating staff shall fill in a Carbon Bed Usage Log to indicate when a bed is put in service, in which position it was used, the atomizing gas flow, the operating duration, and the process solvents.
- 8.6 Operations or Development Services personnel shall notify E & M when beds are required for operation of the dryer. Beds required for use shall be moved adjacent to the PTC building. The Inlet to one bed shall be fitted with the inlet nozzle connected to the vent line from the dryer and dilution nitrogen from the vaporizer. The exhaust of the bed shall be routed to the inlet of the second bed. The exhaust of the second bed is fitted with a discharge elbow to prevent rain from entering. Each vessel is grounded.
- 8.7 **The vent line from the dryer must always be open to allow venting of the dryer during operation.**
- 8.8 When the dryer is prepared to be started, operators shall verify that the vent line from the dryer to the carbon beds is secure and undamaged, connected to the intended carbon bed, and that the vent valving is routed to that carbon bed.
- 8.9 For the PSD2, operators shall verify that the dilution nitrogen hose is connected at the nitrogen vaporizer and the carbon bed inlet.
 - 8.9.1 At the time the dryer operation uses atomizing gas, the dilution nitrogen shall be started. Its supply valve at the nitrogen vaporizer shall be opened -- the regulated pressure to the hose should be 2-6 PSIG. Dilution Nitrogen flow should be approximately 1 CFM per 1 kg/hr of Atomizing gas flow.



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- 8.9.2 When atomization gas is not used (i.e. with pressure nozzle or rotary atomizer), set the dilution nitrogen to a minimum of 20 CFM.
- 8.9.3 Dilution nitrogen shall be turned off when the atomizing gas is shut down. The dilution nitrogen supply valve should be locked-out when it is not being used.
- 8.10 After processing, isolate the carbon beds from air. This is done to prevent combustion in the carbon beds.
 - 8.10.1 Disconnect the process vent prior to purging the process equipment.
 - 8.10.2 Cap or valve off the carbon beds when disconnected.
- 8.11 Upon completion of an operational test or a batch, record the appropriate data on the Usage Log.
 - 8.11.1 PSD1
 - 8.11.1.1 Use the weighing page(s) or process data log sheet(s) to determine the amount of solvent evaporated including startup/shutdown solvent.
 - 8.11.1.2 Enter the information on the Usage Log. (*Note: For the PSD1 N/A the Hours of Operation column.*) Net Emission is equal to the total amount of solvent evaporated.
Solvent Amount = Net Emissions to Carbon Bed
(kg) (kg)
For blends use separate line for each solvent.
 - 8.11.2 PSD2
 - 8.11.2.1 Use the process data log sheet(s) to determine the hours of operation; include spraying time with startup/shutdown solvent, and subtract any down time.
 - 8.11.2.2 Enter the information on the Usage Log. (*Note: For the PSD2 N/A the Amount Evaporated column.*) Net Emission to Carbon Bed is calculated by the following equation:

Run Time x Solvent Factor x Gas Factor x Blend % = Net Emissions to Carbon Bed
(Hours) (kg)



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Solvent	Solvent Factor (kg/kg)
Methylene Chloride	0.38
Acetone	0.13
Methanol	0.03
Ethanol	0.02
Isopropanol	0.02
See Project leader for Solvents not listed	

Set Up	Gas Factor (kg/hr)
Pressure Nozzle	6
Two-Fluid Nozzle	6 + Atomization gas rate in kg/hr
With inductor	6 + Average inductor gas rate in kg/hr

For solvent blends Blend % is the fraction of total for each solvent. Use a separate line for each solvent

- 8.11.3 Keep a running total in the **Total Emissions** column. When the total reaches 250 kg (85% of theoretical worst case capacity) notify the supervisor. When the carbon beds are changed, restart the total in the **Total Emissions** column.
- 8.12 The required capacity will be provided for in scheduling the regeneration of the carbon. Requisitions shall be prepared as needed for the transportation of spent vessels, the reactivation and replacement of carbon, and the return transportation of the beds.
- 8.13 When the capacity is fully consumed, the carbon beds shall be labeled by Operations or Development Services personnel as hazardous waste solids using a label similar to the example label attached. It shall be documented to indicate the date the unit was removed from service and all process solvents that are part of the dryer operation.
- 8.14 Notify E & M and warehouse personnel when carbon beds are scheduled to be picked up.



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Attachment 1

HAZARDOUS WASTE LABEL EXAMPLE

Hazardous Waste

Federal law prohibits improper disposal. If found contact the nearest police, public safety authority or the U.S. environmental protection agency.

Generator Information:

Name: ISP Pharma Technologies

Address: 9165 Rumsey Road

City: Columbia State: MD Zip: 21045

Identification Information:

EPA ID. Number: MDD091818930

Manifest Document Number:

Profile Number: AP-NIROMD-AF-2

Accumulation Date:

Contains:

Waste solids containing flammable liquids, n.o.s.,
Contains

()



STANDARD OPERATING PROCEDURE

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History Page

Edition	Review or Effective Date	Reason(s) for Revision, If applicable:
000	06/24/04	Replaces SOP EQU-42-00, 5/16/00 (Use of Carbon Bed Adsorbers with Utility Spray Dryer SN 531000). Incorporates new format and numbering system. Updated procedure to match current configuration and use. Originator: S. Litwack
001	09/01/05	Changes logo and division name to ISP and ISP Pharma Technologies, as applicable. Minor typographical changes. Originator: W. Neumann
001	09/06/07	Biennial review; no revision required. Reviewed by: R. Ferguson
001	10/28/09	Biennial review; no revision required. Reviewed by: R. Ferguson
002	10/22/10	Insert correct serial number for PSD1 at step 3.5. Change MF-089 to MF-110 at steps 4.2 and 7.2. Replace sections 8.11 and 8.12 with breakdowns of Usage Log for PSD1 and PSD2. Update Form MF-086.1 to reflect this breakdown and clarification. Update logo in SOP and Form. Change "will" to "shall" throughout, where appropriate. Originator: W. Neumann
003	02/09/11	Add section 8.11.3 defining when to notify the supervisor to change carbon beds. Originator: W. Neumann

Product Sheet

VPM-1000 VPM-2000 VPM-2500 VPM-3000

Vapor Phase Adsorbers

General Description

Envirotrol's vapor phase adsorbers are prefabricated steel vessels engineered to remove contaminants and/or odors from air at moderate flow rates with low pressure drop. The steel adsorbers are provided with lifting lugs and are mounted on a fork truck mobile base for easy placement and carbon exchange service. Envirotrol provides a complete turnkey service to handle carbon reactivation and exchange of these adsorbers. They are available in four sizes to best suit your application and they can be provided on a lease or purchase basis. These adsorbers can be utilized by industrial, municipal or commercial users in a variety of air purification applications including but not limited to the following:

- * Emergency Air Quality Control
- * Tank or Sump Air Vents
- * Soil Vapor Extraction
- * Air Stripper Off-Gas
- * Work Environments

Features and Benefits

Adaptable

Adsorbers are charged with the media best suited for your application.

Dependable

Operates continuously with minimal maintenance.

Durable

Adsorber is heavy steel construction lined with a high performance epoxy resin for superior corrosion resistance and long life.

Efficient

Recycle of adsorber vessels and carbon optimizes treatment economics.

Identifiable

Individual serial numbers are assigned to each adsorber to facilitate tracking and documentation.

Portable

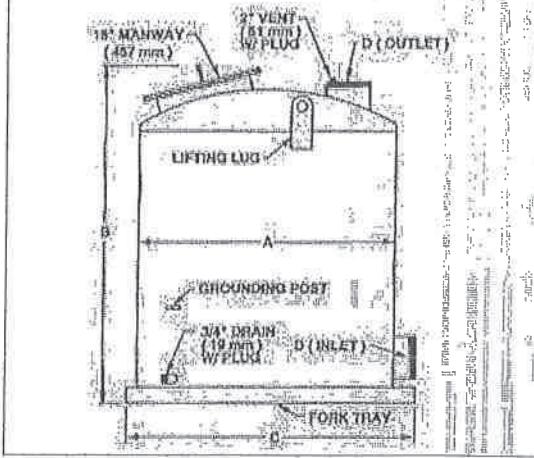
Easily transported and installed at almost any location.

Versatile

Easily configured as single or multiple unit systems to handle higher flows.



STANDARD CONFIGURATION



Operating Parameters

Conditions	Limits
Maximum Working Pressure	15 PSI
Temperature Limit	140° F

Contact Us Today

412.741.2030

Product Sheet

VPM-1000 VPM-2000 VPM-2500 VPM-3000

Vapor Phase Adsorbers

Materials of Construction

Component	Description
Vessel	Carbon Steel
Carbon Bed Support Screen	316 Stainless Steel
Internal Coating	Epoxy Resin
External Coating	Industrial Enamel

Installation and Operation

Vapor phase adsorbers are delivered filled with activated carbon and ready to install. The vessels are self supporting and should be installed on a level, accessible area near the influent source. Installation is easy, requiring flexible hose or pipe connection to the vessel's MNPT inlet and outlet fittings. Hard piped systems require flexible pipe connectors to prevent damage to the vessel's fittings and to make adsorber change-out easier. When the inlet and outlet connections are complete, the vapor phase adsorber is on-line.

Please consult the pressure drop chart to the right to determine your operating parameters. If required, two or more vapor phase adsorbers can be interconnected for series or parallel operation.

Application Limitations

The vapor phase adsorber is offered to be used for high flow air purification applications that typically involve the adsorption of volatile organic contaminants with concentrations much less than 1000 parts per million. If the vapor phase adsorber is to be used in low flow air applications with organic concentrations at or near 1000 parts per million then high heat build-up could occur within the carbon bed due to the heat of adsorption. This heat build-up can be controlled by diluting the high influent contaminant concentration with forced air. The increased air flow dissipate the heat of adsorption and carry it away. The pressure drop chart to the right will assist you in determining an appropriate air flow rate.

Special care should be taken in intermittent flow applications involving ketones, aldehydes or organic acids because these organic compounds can promote unmanageable heat release within the carbon bed. Please contact your Envirotrol Technical Sales Manager concerning these applications.

A Pressure Relief Valve should be installed between the influent source and the adsorber's inlet if the adsorption system will operate at or near the adsorber's maximum working pressure. This will prevent damage to the adsorber vessel and the influent source due to over pressurization.

The use of flame arresters, backflow preventers and vacuum relief should be considered for vapor phase applications that are suspected of promoting heat build-up within the carbon. The inclusion of these equipment items into an adsorption system is primarily for the protection of the influent source. If you are unaware of the reaction of an organic vapor on activated carbon, please contact your Envirotrol Technical Sales Representative for assistance.

All of the optional equipment items described above and other appropriate accessories can be furnished by Envirotrol as required.

Product Sheet

VPM-1000 VPM-2000 VPM-2500 VPM-3000

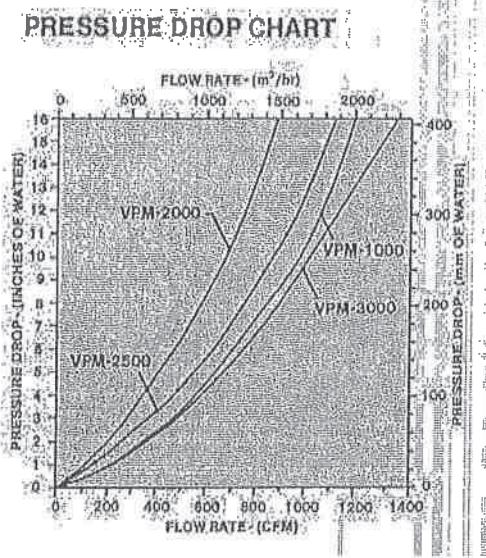
Vapor Phase Adsorbers

Dimensions and Capacities

Adsorbers	A Inches	B Inches	C Inches	D Inches	Max Flow CFM	Carbo Fill (lbs.)	Ship Weight (lbs.)
VPM-1000	48	66	54	8	1000	1000	2100
VPM-2000	48	90	54	8	800	2000	3550
VPM-2500	54	90	60	8	1000	2500	4150
VPM-3000	60	91	66	8	1200	3000	5100

The standard vessel is furnished with MNPT inlet and outlet fittings. The vent and drain are FNPT fittings furnished with a plug. The man way is furnished with a bolted-on cover and neoprene gasket. Other optional fittings can be provided as required. All dimensions and capacities are approximate.

Pressure Drop Information



The pressure drop across a vapor phase adsorber unit is a function of the vapor flow rate as shown on the left pressure drop chart. Additionally, sufficient retention time must be provided within the carbon bed. For this reason, the recommended maximum vapor flow rate through each type of adsorber is as follows:

Type	Limits
VPM-1000	1000 CFM (1699 m³/hr)
VPM-2000	800 CFM (1359 m³/hr)
VPM-2500	1000 CFM (1699 m³/hr)
VPM-3000	1200 CFM (2039 m³/hr)

If higher flows or lower pressure drops are required, multiple vapor phase adsorbers may be installed in parallel operation.

Carbon Change-Out Service

Envirotrol offers a complete turnkey service to change-out activated carbon at your site. This service includes vacuum of the spent carbon, delivery and installation of the fresh carbon and return of the spent carbon to our reactivation facilities. Additionally, Envirotrol offers complete turnkey service to handle carbon reactivation and recycle of the vapor phase adsorbers via our facilities. This is done by disconnecting and draining the adsorber and shipping the adsorber with carbon to Envirotrol.

Safety Information

Whenever workers enter a vessel containing carbon, all precautions must be taken since dangerously low levels of oxygen may be encountered. Atmosphere sampling and work procedures for potentially low oxygen areas should be followed.

Application Limitations

Vapor phase adsorbers are delivered filled with activated carbon and ready to install. The vessels are self supporting and should be installed on a level, accessible area near the influent source. Installation is easy, requiring flexible hose or pipe connection to the vessel's MNPT inlet and outlet fittings. Hard piped systems require flexible pipe connectors to prevent damage to the vessel's fittings, to make adsorber change-out easier, and to prevent damage to the system piping. Additionally, the system piping should include a pressure relief valve installed in an unobstructed part of the inlet line leading to the adsorber's inlet fitting to prevent damage to the adsorber vessel by over pressurization.

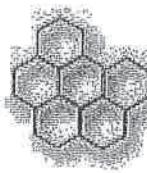
Please consult the pressure drop chart on the previous page to determine your operating parameters. If required, two or more vapor phase adsorbers can be interconnected for series or parallel operation. Please consult your Envirotrol Technical Sales Manager for pressure drop information on multiple steel vapor phase adsorption systems.

For Your Protection

The information and recommendations in this publication are, to the best of our knowledge, reliable. Suggestions made concerning uses or applications are only the opinion of Envirotrol Inc., and users should make their own tests to determine the suitability of these products for their own particular purposes. However, because of numerous factors affecting results, Envirotrol Inc., makes no warranty of any kind, expresses or implied, including those of merchantability and fitness for purpose, other than that the material conforms to its applicable current Standard Specifications. Statements herein, therefore, should not be construed as representations or warranties. The responsibility of Envirotrol for claims arising out of breach of warranty, negligence, strict liability, or otherwise is limited to the purchase price of the materials.

Statements concerning the use of the products or formulations described herein are not to be construed as recommending the infringement of any patent and no liability for infringement arising out of any such use is assumed.

Standards specifications, although, current at the time of publication, are subject to change without notice.



Envirotrol, Inc.

432 Green Street P.O. Box 61
Sewickley, PA 15143
412.741.2030

Product Description

Envirotrol's EI-410RS is a reactivated coconut shell base carbon of 4 x 10 mesh. This carbon meets the same specification as its virgin counterpart, but with an added cost savings. This coconut shell carbon provides superior hardness and minimum dust. EI-410RS is typically used in HVAC and Odor Control applications.

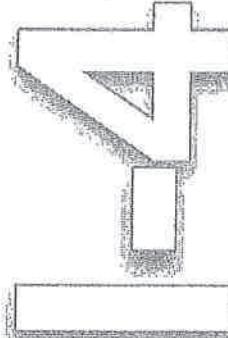
Grade EI-410RS is available in 1000 lb bulk sacks or in bulk. All other packaging is available at a premium. EI-410RS is produced by steam activated process and is therefore excluded from IATA#395, IMCO Class 4.2 or UN1362, Freight Classification: NMFC #40560; UFC - #20460.

CARBON DEPLETES OXYGEN FROM AIR.

All precautions must be taken since dangerously low levels of oxygen may be encountered.

Product Specifications

- Carbon Tetrachloride Number (wt%):
- Iodine Number (mg.g), min.
- Hardness Number (min.):
- Moisture (as packed, weight %):
- U.S. Standard Sieve Size:
- Greater than 4 mesh (max.):
- Less than 6 mesh (max.):
- Apparent Density (dense packing, g/ml)



EI-410RS
60%
950
95
2.0%
4x10
5%
5%
0.44 - 0.49

The information and recommendations in this publication are, to the best of our knowledge, reliable. Suggestions made concerning uses or applications are only the opinion of Envirotrol Inc., and users should make their own tests to determine the suitability of these products for their own particular purposes. However, because of numerous factors affecting results, Envirotrol Inc., makes no warranty of any kind, express or implied, including those of merchantability and fitness for purpose, other than that the material conforms to its applicable current Standard Specifications. Statements herein, therefore, should not be construed as representations or warranties. The responsibility of Envirotrol for claims arising out of breach of warranty, negligence, strict liability, or otherwise is limited to the purchase price of the materials.

Statements concerning the use of the products or formulations described herein are not to be construed as recommending the infringement of any patent and no liability for infringement arising out of any such use is assumed.

Shipping Information: F.O.B. Points: Rochester, PA

Buchi
Spray Dryer
Registration

Delaware Dept. of Natural Resources and Environment Control
Air Contaminant Equipment Registration Form

Registration No.

Purpose: To register equipment pursuant to Regulation No 2, § 2.1(a) of Delaware's "Regulations Governing the control of Air Pollution."

Directions : If self-registering, complete Parts 1-7. If not self-registering, complete Parts 1-4 and 6-7 and leave Parts 5 blank. For more information on completing this form see the *Air Contaminant Equipment Registration Instruction Booklet*.

For Department Use Only.

PART 1 SITE INFORMATION

NAME Hercules Inc., Ashland Research Center	STREET ADDRESS 500 Hercules Road	CITY Wilmington
STATE DE	ZIP CODE 19808	TELEPHONE NUMBER (302) 995-3455 ext.

PART 3 EMISSION SOURCE INFORMATION Complete Section A, and either B, C, or D, as applicable (see *Instruction booklet* for source types and metric unit conversion table).

PART 4 AIR CONTAMINANT INFORMATION
(If more than air contaminants will be emitted, attach additional information to this form.)

Is the source equipped with an air contaminant control device? Yes No
Do any other source emit air contaminants to the same emission point as the same equipment to be registered?
Yes No

PART 2 EMISSION SOURCE DESCRIPTION Describe the source. Include physical location of the equipment, its purpose, and provide a model number, if applicable.

Buchi mini spray dryer unit with Inert Loop (B-290 and B-295) located in Building 8162 lab 177 exhausting to general exhaust. Lab staff will work with any of the 5 solvents listed below each day up to the maximum quantity of 9.5 pounds per day. The Inert Loop B-295 is required by the manufacturer for safe use with organic solvents recovering 70 - 90 percent of the solvent. See additional page for two more air contaminants and the total for Part 4 D.

A.	B.				C.				D.			
	1.	2.	3.	4.	1.	2.	3.	4.	1.	2.	3.	4.
Distance to Nearest Property line, m	Stack Height, m	Stack Exit Inside Diameter, m	ACFM or m ³ /s, Or Velocity m/s	Stack Exit Temperature, K	Source Height, m	Length of Larger Side, m	Length of Smaller Side, m	Half of Source Height, m	Initial Lateral Dimension, m	Initial Vertical Dimension, m		

126.8 12.8 0.8 14000 293 NA NA NA NA NA NA NA

PART 5 TOXICOLOGICAL DATA AND DIS-PERSON MODEL RESULTS Complete this section only if self-registering. Attach SCREEN model output.

A.	B. Max. Daily Hours of Emissions from Equipment	C. Maximum Emission Rate (without control device)	A.	B.	C.	D.	MDC					
							1.	2. (Circle one) Point, g/s, Area g/s-m ² , or Volume, g/s lb/day	3. Basis (i.e., calculated, manufacturer's info, etc)	TLV (TWA), mg/m ³	From SCREEN, µg/m ³	Adjusted MDC, mg/m ³ Block 5(B) x 0.00007
Air Contaminant												
Acetone	8	7.5	0.12	Calculated	1187	15.04	0.01052			112758		
Ethanol	8	7.5	0.12	Calculated	1884	15.04	0.01052			178975		
Methanol	8	7.5	0.12	Calculated	262	15.04	0.01052			24894		
			D.	Cont'd								

All footnotes are back of form TOTAL

Be sure to read and sign back of form.

Ashland Buchi Mini-Spray Dryer Air Contaminant Equipment Registration Form

Part 4 Air Contaminant Information - Continued

Part 4 Air Contaminant Information - Continued				Part 5 Toxicological Data and Dispersion Modeling Results with SCREEN Output Attached			
A.	B.	C.	D.	A.	B.	C.	D.
Air Contaminant	Max. Daily Hours of Emissions from Equipment	Maximum Emission Rate (without control device)	TLV (TWA) mg/m ³	MDC from SCREEN (μg/m ³)	Adjusted MDC, mg/m ³ Block 5(B) × 0.0007	TLV: Adjusted MDC, mg/m ³ Block 5(A) / Block 5(C)	
	1. lb/day	2. Point, g/s Basis	3. Basis				
1:2 Methanol/ Methylene Chloride Mixture	7	9.5 0.17 Calculated	174 21.31	0.014917	11,665		
Tetrahydrofuran	8	8.5 0.13 Calculated	147 16.3	0.01141	12,883		
	TOTAL = Maximum lb/day of 1:2 Methanol / Methylene Chloride Mixture	9.5					

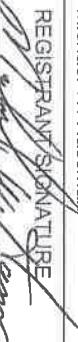
PART 6 CONDITIONS OF REGISTRATION. The registrant may commence construction/operation if the maximum aggregate air contaminant emission rate (Block 4(D)) is less than ten (10) pounds per day, each and every day, and if the TLV:Adjusted MDC (Block 5(D)) ratio for each air contaminant emitted is equal to or greater than 100. As an option, the registrant may submit to the Department all of the information required on this form except for the information required in Part 5 Toxicological Data and Dispersion Modeling Results, and may request that the Department identify the TLV (Block 5(A)) and determine the MDC (Block 5(B)) and the TLV:Adjusted MDC ratio (Block 5(D)). In such a case, the registrant shall not commence construction/operation until written approval is obtained from the Department.

PART 7 CERTIFICATION. The registrant shall be the person identified in Regulation No. 2, Section 3.1. A copy of this registration shall be maintained on the premises where the equipment is located and shall be made available to a representative of the Department upon request. The registrant shall notify the Department in writing prior to making any change that will change any of the information on this form.

I certify that all of the information on this form is true, accurate, and complete. If at any time the emission rate exceeds ten (10) pounds per day, or if any parameter changes such that the TLV:Adjusted MDC ratio falls below 100, a violation of Regulation No. 2 of Delaware's "Regulations Governing the Control of Air Pollution" may have occurred, and all necessary permits must be secured for operation of said equipment.

REGISTRANT NAME (Please print or type)

Michael W. Hassmeyer



REGISTRANT MAILING ADDRESS (if different from site address in Part 1)

STREET ADDRESS

CITY

STATE

ZIP CODE

TELEPHONE NUMBER
() - Ext.

TABLE 1 Input parameters for SCREEN air dispersion model.

PARAMETER	POINT SOURCE	AREA SOURCE	VOLUME SOURCE
GENERAL	Select Rural, Flat Terrain, Full Meteorology, and Automated Distance Array with Block 3(A) ^a and	5000 as distance selection.	

EMISSION RATE	Maximum Rate without Control Device (Block 4(C)(2)) ^c	Height of Source Release from Ground (Block 3(D)(1))	Half of Source Release Height (Block 3(D)(1))
EMISSION RELEASE HEIGHT	Height to Top of Stack from Ground (Block 3(B)(1))	Length of Larger Side (Block 3(C)(2))	Initial Lateral = length of shorter side Dimension 4.3
SOURCE DIMENSIONS	Stack Inside Diameter (Block 3(B)(2))	Length of Smaller Side (Block 3(C)(3))	Initial Lateral = length of source Dimension 2.15
EXIT FLOW RATE OR EXIT VELOCITY	Measured or Calculated Exit Velocity or Flow Rate (Block 3(B)(3))	NA	NA
EXIT GAS TEMPERATURE	Temperature of Emissions (Block 3(B)(4))	NA	NA
AMBIENT TEMPERATURE	NA	NA	NA
RECEPTOR FLAGPOLE HEIGHT	293°K (67.7°F)	Zero	Zero
a	Enter the distance from the equipment to the nearest property line (Block 3(A)).	d	Threshold LimitValue(TLV) expressed as a time-weighted average (TWA) as established by ACGH or NIOSH, or other Department-approved human health exposure value.
b	Initial lateral and vertical dimensions defined in the above table.	e	Maximum Downwind Concentration (MDC) beyond the nearest property line as predicted by the SCREEN model.
c	Note that the maximum emission rate is to the atmosphere for uncontrolled sources and to the inlet of the control device for source with an air contaminant control device. Emission rates for area sources are obtained by dividing the emission rate by the area of the source.	f	If velocity is entered, type in numeric value. If flow rate is entered, type in "vf=" followed by the cfm numeric value, or type in "vm=" followed by the metric numeric value.

Emissions BEFORE Controls

Solvent	Spec. Grav (gr/ml)	Max B290/B295 Spray Rate with 70% efficiency (ml/hour) ¹	Max Hours /Day	total seconds of operation	Total Amount (ml)	Total Lbs/day	Grams/second	TLV from Screen (mg/m ³)	MDC from Screen (μg/m ³)	Adjusted MDC (mg/m ³) (MDC from Screen x 0.0007)	TLV : Adjusted MDC (TLV / Adjusted MDC) (must be above 100 for registration)	Notes
Acetone	0.787	540	8	28800	4320	7.5	0.12	1187	15.04	0.010528	112,758	
Ethanol	0.787	540	8	28800	4320	7.5	0.12	1884	15.04	0.010528	178,975	
Methanol	0.791	540	8	28800	4320	7.5	0.12	262	15.04	0.010528	24,894	
1:2 Methanol/ Methylene Chloride Mixture ²	1.1454	540	7	25200	3780	9.5	0.17	174	21.31	0.014917	11,643	Use TLV for Methylene Chloride, no TLV available for mixture
Tetrahydrofuran	0.889	540	8	28800	4320	8.5	0.13	147	16.3	0.01141	12,922	
¹ Buchi manufacturer representative advised that equipment flow rate maximum is 30 ml/minute, with 70% efficiency to be conservative												
² Methylene Chloride will always be used as a mixture with methanol												

Acetone

05/18/16

14:00:43

*** SCREEN3 MODEL RUN ***
 *** VERSION DATED 13043 ***

Ashland B8162 Lab 177 Buchi Spray Dryer - Acetone

SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	POINT
EMISSION RATE (G/S)	=	0.120000
STACK HEIGHT (M)	=	12.8000
STK INSIDE DIAM (M)	=	0.8000
STK EXIT VELOCITY (M/S)	=	13.1447
STK GAS EXIT TEMP (K)	=	293.0000
AMBIENT AIR TEMP (K)	=	293.0000
RECEPTOR HEIGHT (M)	=	0.0000
URBAN/RURAL OPTION	=	RURAL
BUILDING HEIGHT (M)	=	0.0000
MIN HORIZ BLDG DIM (M)	=	0.0000
MAX HORIZ BLDG DIM (M)	=	0.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.

THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

STACK EXIT VELOCITY WAS CALCULATED FROM
 VOLUME FLOW RATE = 14000.000 (ACFM)

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 27.645 M**4/S**2.

*** FULL METEOROLOGY ***

 *** SCREEN AUTOMATED DISTANCES ***

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M) DWASH	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)
NO 127.	9.498	1	2.5	2.5	800.0	25.20	33.42	18.27
NO 200.	9.980	3	3.5	3.6	1120.0	21.59	23.75	14.25
NO 300.	10.34	3	2.0	2.0	640.0	28.19	34.57	20.80
NO 400.	9.559	3	1.5	1.5	480.0	33.32	45.03	27.09

Acetone

	500.	11.54	5	1.0	1.1 10000.0	27.70	27.35	13.49
NO	600.	13.80	5	1.0	1.1 10000.0	27.70	32.21	15.30
NO	700.	14.84	5	1.0	1.1 10000.0	27.70	37.02	17.05
NO	800.	15.03	5	1.0	1.1 10000.0	27.70	41.76	18.76
NO	900.	14.72	5	1.0	1.1 10000.0	27.70	46.46	20.42
NO	1000.	14.12	5	1.0	1.1 10000.0	27.70	51.12	22.04
NO	1100.	13.62	6	1.0	1.1 10000.0	26.15	37.16	15.30
NO	1200.	13.80	6	1.0	1.1 10000.0	26.15	40.20	16.12
NO	1300.	13.80	6	1.0	1.1 10000.0	26.15	43.21	16.91
NO	1400.	13.67	6	1.0	1.1 10000.0	26.15	46.20	17.68
NO	1500.	13.44	6	1.0	1.1 10000.0	26.15	49.18	18.43
NO	1600.	13.16	6	1.0	1.1 10000.0	26.15	52.13	19.16
NO	1700.	12.82	6	1.0	1.1 10000.0	26.15	55.07	19.88
NO	1800.	12.47	6	1.0	1.1 10000.0	26.15	57.99	20.59
NO	1900.	12.09	6	1.0	1.1 10000.0	26.15	60.90	21.28
NO	2000.	11.72	6	1.0	1.1 10000.0	26.15	63.79	21.96
NO	2100.	11.32	6	1.0	1.1 10000.0	26.15	66.67	22.54
NO	2200.	10.94	6	1.0	1.1 10000.0	26.15	69.53	23.10
NO	2300.	10.57	6	1.0	1.1 10000.0	26.15	72.38	23.65
NO	2400.	10.22	6	1.0	1.1 10000.0	26.15	75.22	24.19
NO	2500.	9.878	6	1.0	1.1 10000.0	26.15	78.04	24.72
NO	2600.	9.553	6	1.0	1.1 10000.0	26.15	80.85	25.24
NO	2700.	9.243	6	1.0	1.1 10000.0	26.15	83.66	25.75
NO	2800.	8.947	6	1.0	1.1 10000.0	26.15	86.45	26.26
NO	2900.	8.663	6	1.0	1.1 10000.0	26.15	89.23	26.76
NO	3000.	8.393	6	1.0	1.1 10000.0	26.15	92.00	27.24
NO	3500.	7.232	6	1.0	1.1 10000.0	26.15	105.72	29.23

Acetone

NO	4000.	6.317	6	1.0	1.1	10000.0	26.15	119.23	31.07
NO	4500.	5.582	6	1.0	1.1	10000.0	26.15	132.56	32.79
NO	5000.	4.982	6	1.0	1.1	10000.0	26.15	145.72	34.42
NO									

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 127. M:
780. 15.04 5 1.0 1.1 10000.0 27.70 40.87 18.44
NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

*** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	15.04	780.	0.

** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

Ethanol

05/18/16

14:04:41

*** SCREEN3 MODEL RUN ***
 *** VERSION DATED 13043 ***

Ashland B8162 Lab 177 Buchi Spray Dryer - Ethanol

SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	POINT
EMISSION RATE (G/S)	=	0.120000
STACK HEIGHT (M)	=	12.8000
STK INSIDE DIAM (M)	=	0.8000
STK EXIT VELOCITY (M/S)	=	13.1447
STK GAS EXIT TEMP (K)	=	293.0000
AMBIENT AIR TEMP (K)	=	293.0000
RECEPTOR HEIGHT (M)	=	0.0000
URBAN/RURAL OPTION	=	RURAL
BUILDING HEIGHT (M)	=	0.0000
MIN HORIZ BLDG DIM (M)	=	0.0000
MAX HORIZ BLDG DIM (M)	=	0.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.

THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

STACK EXIT VELOCITY WAS CALCULATED FROM
 VOLUME FLOW RATE = 14000.000 (ACFM)

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 27.645 M**4/S**2.

*** FULL METEOROLOGY ***

 *** SCREEN AUTOMATED DISTANCES ***

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M) DWASH	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)
NO 127.	9.498	1	2.5	2.5	800.0	25.20	33.42	18.27
NO 200.	9.980	3	3.5	3.6	1120.0	21.59	23.75	14.25
NO 300.	10.34	3	2.0	2.0	640.0	28.19	34.57	20.80
NO 400.	9.559	3	1.5	1.5	480.0	33.32	45.03	27.09

Ethanol

	500.	11.54	5	1.0	1.1	10000.0	27.70	27.35	13.49
NO	600.	13.80	5	1.0	1.1	10000.0	27.70	32.21	15.30
NO	700.	14.84	5	1.0	1.1	10000.0	27.70	37.02	17.05
NO	800.	15.03	5	1.0	1.1	10000.0	27.70	41.76	18.76
NO	900.	14.72	5	1.0	1.1	10000.0	27.70	46.46	20.42
NO	1000.	14.12	5	1.0	1.1	10000.0	27.70	51.12	22.04
NO	1100.	13.62	6	1.0	1.1	10000.0	26.15	37.16	15.30
NO	1200.	13.80	6	1.0	1.1	10000.0	26.15	40.20	16.12
NO	1300.	13.80	6	1.0	1.1	10000.0	26.15	43.21	16.91
NO	1400.	13.67	6	1.0	1.1	10000.0	26.15	46.20	17.68
NO	1500.	13.44	6	1.0	1.1	10000.0	26.15	49.18	18.43
NO	1600.	13.16	6	1.0	1.1	10000.0	26.15	52.13	19.16
NO	1700.	12.82	6	1.0	1.1	10000.0	26.15	55.07	19.88
NO	1800.	12.47	6	1.0	1.1	10000.0	26.15	57.99	20.59
NO	1900.	12.09	6	1.0	1.1	10000.0	26.15	60.90	21.28
NO	2000.	11.72	6	1.0	1.1	10000.0	26.15	63.79	21.96
NO	2100.	11.32	6	1.0	1.1	10000.0	26.15	66.67	22.54
NO	2200.	10.94	6	1.0	1.1	10000.0	26.15	69.53	23.10
NO	2300.	10.57	6	1.0	1.1	10000.0	26.15	72.38	23.65
NO	2400.	10.22	6	1.0	1.1	10000.0	26.15	75.22	24.19
NO	2500.	9.878	6	1.0	1.1	10000.0	26.15	78.04	24.72
NO	2600.	9.553	6	1.0	1.1	10000.0	26.15	80.85	25.24
NO	2700.	9.243	6	1.0	1.1	10000.0	26.15	83.66	25.75
NO	2800.	8.947	6	1.0	1.1	10000.0	26.15	86.45	26.26
NO	2900.	8.663	6	1.0	1.1	10000.0	26.15	89.23	26.76
NO	3000.	8.393	6	1.0	1.1	10000.0	26.15	92.00	27.24
NO	3500.	7.232	6	1.0	1.1	10000.0	26.15	105.72	29.23

Ethanol

NO	4000.	6.317	6	1.0	1.1	10000.0	26.15	119.23	31.07
NO	4500.	5.582	6	1.0	1.1	10000.0	26.15	132.56	32.79
NO	5000.	4.982	6	1.0	1.1	10000.0	26.15	145.72	34.42
NO									

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 127. M:
NO
780. 15.04 5 1.0 1.1 10000.0 27.70 40.87 18.44

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

*** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	15.04	780.	0.

** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

Methanol

05/18/16

14:07:55

*** SCREEN3 MODEL RUN ***
 *** VERSION DATED 13043 ***

Ashland B8162 Lab 177 Buchi Spray Dryer - Methanol

SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	POINT
EMISSION RATE (G/S)	=	0.120000
STACK HEIGHT (M)	=	12.8000
STK INSIDE DIAM (M)	=	0.8000
STK EXIT VELOCITY (M/S)	=	13.1447
STK GAS EXIT TEMP (K)	=	293.0000
AMBIENT AIR TEMP (K)	=	293.0000
RECEPTOR HEIGHT (M)	=	0.0000
URBAN/RURAL OPTION	=	RURAL
BUILDING HEIGHT (M)	=	0.0000
MIN HORIZ BLDG DIM (M)	=	0.0000
MAX HORIZ BLDG DIM (M)	=	0.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.

THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

STACK EXIT VELOCITY WAS CALCULATED FROM
 VOLUME FLOW RATE = 14000.000 (ACFM)

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 27.645 M**4/S**2.

*** FULL METEOROLOGY ***

 *** SCREEN AUTOMATED DISTANCES ***

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M) DWASH	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)
NO 127.	9.498	1	2.5	2.5	800.0	25.20	33.42	18.27
NO 200.	9.980	3	3.5	3.6	1120.0	21.59	23.75	14.25
NO 300.	10.34	3	2.0	2.0	640.0	28.19	34.57	20.80
NO 400.	9.559	3	1.5	1.5	480.0	33.32	45.03	27.09

Methanol

	500.	11.54	5	1.0	1.1	10000.0	27.70	27.35	13.49
NO	600.	13.80	5	1.0	1.1	10000.0	27.70	32.21	15.30
NO	700.	14.84	5	1.0	1.1	10000.0	27.70	37.02	17.05
NO	800.	15.03	5	1.0	1.1	10000.0	27.70	41.76	18.76
NO	900.	14.72	5	1.0	1.1	10000.0	27.70	46.46	20.42
NO	1000.	14.12	5	1.0	1.1	10000.0	27.70	51.12	22.04
NO	1100.	13.62	6	1.0	1.1	10000.0	26.15	37.16	15.30
NO	1200.	13.80	6	1.0	1.1	10000.0	26.15	40.20	16.12
NO	1300.	13.80	6	1.0	1.1	10000.0	26.15	43.21	16.91
NO	1400.	13.67	6	1.0	1.1	10000.0	26.15	46.20	17.68
NO	1500.	13.44	6	1.0	1.1	10000.0	26.15	49.18	18.43
NO	1600.	13.16	6	1.0	1.1	10000.0	26.15	52.13	19.16
NO	1700.	12.82	6	1.0	1.1	10000.0	26.15	55.07	19.88
NO	1800.	12.47	6	1.0	1.1	10000.0	26.15	57.99	20.59
NO	1900.	12.09	6	1.0	1.1	10000.0	26.15	60.90	21.28
NO	2000.	11.72	6	1.0	1.1	10000.0	26.15	63.79	21.96
NO	2100.	11.32	6	1.0	1.1	10000.0	26.15	66.67	22.54
NO	2200.	10.94	6	1.0	1.1	10000.0	26.15	69.53	23.10
NO	2300.	10.57	6	1.0	1.1	10000.0	26.15	72.38	23.65
NO	2400.	10.22	6	1.0	1.1	10000.0	26.15	75.22	24.19
NO	2500.	9.878	6	1.0	1.1	10000.0	26.15	78.04	24.72
NO	2600.	9.553	6	1.0	1.1	10000.0	26.15	80.85	25.24
NO	2700.	9.243	6	1.0	1.1	10000.0	26.15	83.66	25.75
NO	2800.	8.947	6	1.0	1.1	10000.0	26.15	86.45	26.26
NO	2900.	8.663	6	1.0	1.1	10000.0	26.15	89.23	26.76
NO	3000.	8.393	6	1.0	1.1	10000.0	26.15	92.00	27.24
NO	3500.	7.232	6	1.0	1.1	10000.0	26.15	105.72	29.23

Methanol

4000.	6.317	6	1.0	1.1	10000.0	26.15	119.23	31.07
NO								
4500.	5.582	6	1.0	1.1	10000.0	26.15	132.56	32.79
NO								
5000.	4.982	6	1.0	1.1	10000.0	26.15	145.72	34.42
NO								

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 127. M:
780. 15.04 5 1.0 1.1 10000.0 27.70 40.87 18.44
NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

*** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	15.04	780.	0.

** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

1:2 Methanol / Methylene Chloride Mix

05/18/16

14:10:41

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 13043 ***

Ashland B8162 Lab 177 Buchi Spray Dryer - 1:2 Methanol / Methylene Chloride Mix

SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	POINT
EMISSION RATE (G/S)	=	0.170000
STACK HEIGHT (M)	=	12.8000
STK INSIDE DIAM (M)	=	0.8000
STK EXIT VELOCITY (M/S)	=	13.1447
STK GAS EXIT TEMP (K)	=	293.0000
AMBIENT AIR TEMP (K)	=	293.0000
RECEPTOR HEIGHT (M)	=	0.0000
URBAN/RURAL OPTION	=	RURAL
BUILDING HEIGHT (M)	=	0.0000
MIN HORIZ BLDG DIM (M)	=	0.0000
MAX HORIZ BLDG DIM (M)	=	0.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.

THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

STACK EXIT VELOCITY WAS CALCULATED FROM
VOLUME FLOW RATE = 14000.000 (ACFM)

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 27.645 M**4/S**2.

*** FULL METEOROLOGY ***

*** SCREEN AUTOMATED DISTANCES ***

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

1:2 Methanol / Methylene Chloride Mix

NO	500.	16.34	5	1.0	1.1 10000.0	27.70	27.35	13.49
NO	600.	19.55	5	1.0	1.1 10000.0	27.70	32.21	15.30
NO	700.	21.02	5	1.0	1.1 10000.0	27.70	37.02	17.05
NO	800.	21.29	5	1.0	1.1 10000.0	27.70	41.76	18.76
NO	900.	20.85	5	1.0	1.1 10000.0	27.70	46.46	20.42
NO	1000.	20.00	5	1.0	1.1 10000.0	27.70	51.12	22.04
NO	1100.	19.29	6	1.0	1.1 10000.0	26.15	37.16	15.30
NO	1200.	19.55	6	1.0	1.1 10000.0	26.15	40.20	16.12
NO	1300.	19.55	6	1.0	1.1 10000.0	26.15	43.21	16.91
NO	1400.	19.36	6	1.0	1.1 10000.0	26.15	46.20	17.68
NO	1500.	19.05	6	1.0	1.1 10000.0	26.15	49.18	18.43
NO	1600.	18.64	6	1.0	1.1 10000.0	26.15	52.13	19.16
NO	1700.	18.17	6	1.0	1.1 10000.0	26.15	55.07	19.88
NO	1800.	17.66	6	1.0	1.1 10000.0	26.15	57.99	20.59
NO	1900.	17.13	6	1.0	1.1 10000.0	26.15	60.90	21.28
NO	2000.	16.60	6	1.0	1.1 10000.0	26.15	63.79	21.96
NO	2100.	16.04	6	1.0	1.1 10000.0	26.15	66.67	22.54
NO	2200.	15.50	6	1.0	1.1 10000.0	26.15	69.53	23.10
NO	2300.	14.98	6	1.0	1.1 10000.0	26.15	72.38	23.65
NO	2400.	14.47	6	1.0	1.1 10000.0	26.15	75.22	24.19
NO	2500.	13.99	6	1.0	1.1 10000.0	26.15	78.04	24.72
NO	2600.	13.53	6	1.0	1.1 10000.0	26.15	80.85	25.24
NO	2700.	13.09	6	1.0	1.1 10000.0	26.15	83.66	25.75
NO	2800.	12.67	6	1.0	1.1 10000.0	26.15	86.45	26.26
NO	2900.	12.27	6	1.0	1.1 10000.0	26.15	89.23	26.76
NO	3000.	11.89	6	1.0	1.1 10000.0	26.15	92.00	27.24
NO	3500.	10.25	6	1.0	1.1 10000.0	26.15	105.72	29.23

1:2 Methanol / Methylene Chloride Mix

NO	4000.	8.949	6	1.0	1.1	10000.0	26.15	119.23	31.07
NO	4500.	7.908	6	1.0	1.1	10000.0	26.15	132.56	32.79
NO	5000.	7.058	6	1.0	1.1	10000.0	26.15	145.72	34.42

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 127. M:

NO	780.	21.31	5	1.0	1.1	10000.0	27.70	40.87	18.44
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DWASH= MEANS NO CALC MADE (CONC = 0.0)

DWASH=NO MEANS NO BUILDING DOWNWASH USED

DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED

DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED

DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

*** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	21.31	780.	0.

** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **

Tetrahydrofuran

05/18/16

14:16:04

*** SCREEN3 MODEL RUN ***
 *** VERSION DATED 13043 ***

Ashland B8162 Lab 177 Buchi Spray Dryer - Tetrahydrofuran

SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	POINT
EMISSION RATE (G/S)	=	0.130000
STACK HEIGHT (M)	=	12.8000
STK INSIDE DIAM (M)	=	0.8000
STK EXIT VELOCITY (M/S)	=	13.1447
STK GAS EXIT TEMP (K)	=	293.0000
AMBIENT AIR TEMP (K)	=	293.0000
RECEPTOR HEIGHT (M)	=	0.0000
URBAN/RURAL OPTION	=	RURAL
BUILDING HEIGHT (M)	=	0.0000
MIN HORIZ BLDG DIM (M)	=	0.0000
MAX HORIZ BLDG DIM (M)	=	0.0000

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.

THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

STACK EXIT VELOCITY WAS CALCULATED FROM
 VOLUME FLOW RATE = 14000.000 (ACFM)

BUOY. FLUX = 0.000 M**4/S**3; MOM. FLUX = 27.645 M**4/S**2.

*** FULL METEOROLOGY ***

 *** SCREEN AUTOMATED DISTANCES ***

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M) DWASH	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)
127. NO	10.29	1	2.5	2.5	800.0	25.20	33.42	18.27
200. NO	10.81	3	3.5	3.6	1120.0	21.59	23.75	14.25
300. NO	11.20	3	2.0	2.0	640.0	28.19	34.57	20.80
400. NO	10.36	3	1.5	1.5	480.0	33.32	45.03	27.09

Tetrahydrofuran

	500.	12.50	5	1.0	1.1 10000.0	27.70	27.35	13.49
NO	600.	14.95	5	1.0	1.1 10000.0	27.70	32.21	15.30
NO	700.	16.07	5	1.0	1.1 10000.0	27.70	37.02	17.05
NO	800.	16.28	5	1.0	1.1 10000.0	27.70	41.76	18.76
NO	900.	15.94	5	1.0	1.1 10000.0	27.70	46.46	20.42
NO	1000.	15.29	5	1.0	1.1 10000.0	27.70	51.12	22.04
NO	1100.	14.75	6	1.0	1.1 10000.0	26.15	37.16	15.30
NO	1200.	14.95	6	1.0	1.1 10000.0	26.15	40.20	16.12
NO	1300.	14.95	6	1.0	1.1 10000.0	26.15	43.21	16.91
NO	1400.	14.81	6	1.0	1.1 10000.0	26.15	46.20	17.68
NO	1500.	14.56	6	1.0	1.1 10000.0	26.15	49.18	18.43
NO	1600.	14.25	6	1.0	1.1 10000.0	26.15	52.13	19.16
NO	1700.	13.89	6	1.0	1.1 10000.0	26.15	55.07	19.88
NO	1800.	13.51	6	1.0	1.1 10000.0	26.15	57.99	20.59
NO	1900.	13.10	6	1.0	1.1 10000.0	26.15	60.90	21.28
NO	2000.	12.69	6	1.0	1.1 10000.0	26.15	63.79	21.96
NO	2100.	12.26	6	1.0	1.1 10000.0	26.15	66.67	22.54
NO	2200.	11.85	6	1.0	1.1 10000.0	26.15	69.53	23.10
NO	2300.	11.45	6	1.0	1.1 10000.0	26.15	72.38	23.65
NO	2400.	11.07	6	1.0	1.1 10000.0	26.15	75.22	24.19
NO	2500.	10.70	6	1.0	1.1 10000.0	26.15	78.04	24.72
NO	2600.	10.35	6	1.0	1.1 10000.0	26.15	80.85	25.24
NO	2700.	10.01	6	1.0	1.1 10000.0	26.15	83.66	25.75
NO	2800.	9.692	6	1.0	1.1 10000.0	26.15	86.45	26.26
NO	2900.	9.385	6	1.0	1.1 10000.0	26.15	89.23	26.76
NO	3000.	9.092	6	1.0	1.1 10000.0	26.15	92.00	27.24
NO	3500.	7.835	6	1.0	1.1 10000.0	26.15	105.72	29.23

Tetrahydrofuran

NO	4000.	6.843	6	1.0	1.1 10000.0	26.15	119.23	31.07
NO	4500.	6.047	6	1.0	1.1 10000.0	26.15	132.56	32.79
NO	5000.	5.397	6	1.0	1.1 10000.0	26.15	145.72	34.42

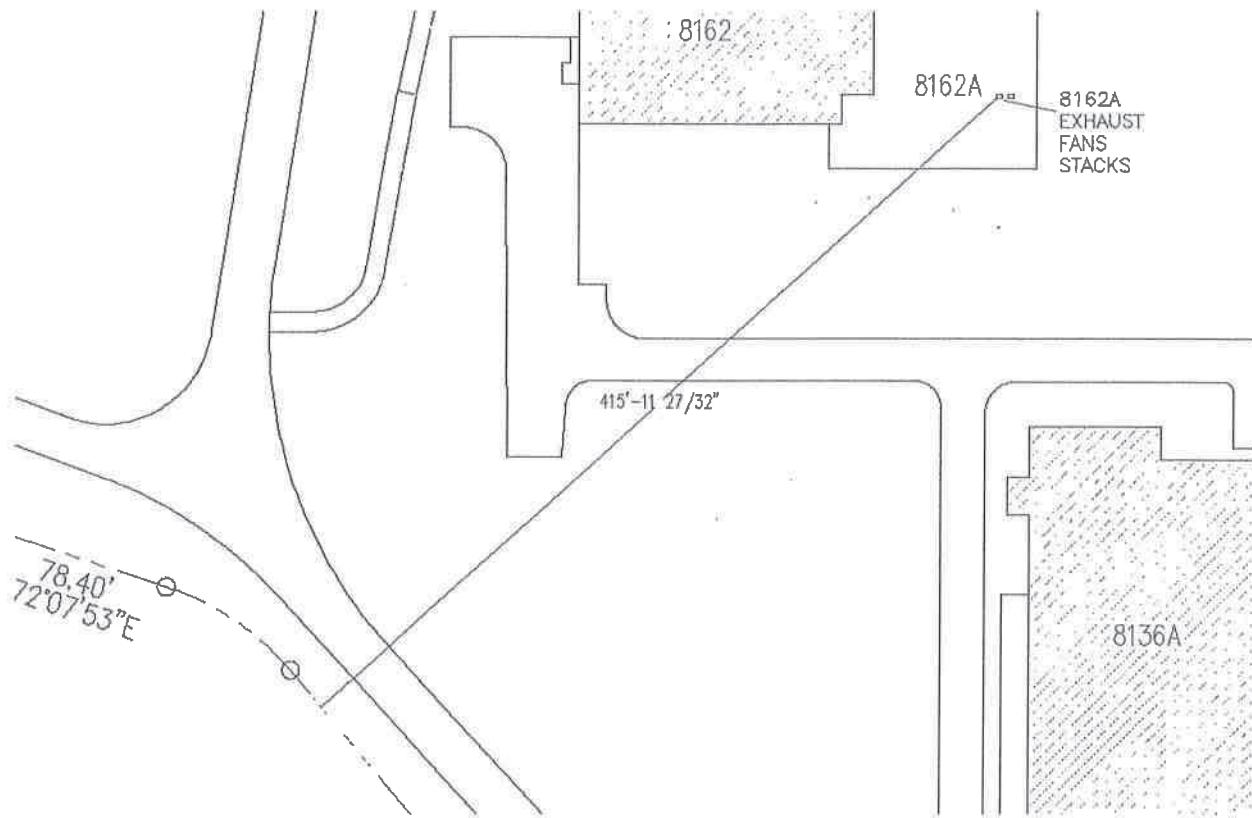
MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 127. M:
 NO 780. 16.30 5 1.0 1.1 10000.0 27.70 40.87 18.44

DWASH= MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

 *** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	16.30	780.	0.

 ** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **



Ashland Inc. - Ashland Research Center							Potential to Emit			
Source Description	Air Quality Permit Number	Location (Building)	PM	PM10	PM2.5	CO	NOX	SOX	VOC	
B001-1 25.106 MMBTU/hr Boiler ⁽¹⁾	APC-2007/0168; Issued 7/16/2008	8502		0.537		4.09097	4.119	0.2207	0.353	
B002-1 25.106 MMBTU/hr Boiler ⁽¹⁾	APC-2007/0169; Issued 7/16/2008	8502		0.537		4.09097	4.119	0.2207	0.353	
R&D - Cellulose Cutter ⁽²⁾	APC-2006/0016; Issued 4/5/2007	8150		0.009						
Aquarius Powder Blending & Dust Collector ⁽²⁾	Apc-2006/0180; Issued 2/25/2009	8159	1.3							
Research and Development Activities - Two lb hood exhaust systems - No APC Equipment ⁽³⁾	APC-95/0402 (Amend. 4); ISSUED 8/4/2006	8136/8136A							6.57	
Research and Development Activities - Three lab hood exhaust systems - No APC Equipment ⁽³⁾	APC-95/0546 (Amend. 6); ISSUED 12/29/2000	8100							5.41	
R&D GMP Spray Dryer (before carbon beds)	APC-2016/0039-Operation (VOC RACT); Issued 10/29/2015	8162							1.256	
R&D R&D Spray Dryer (before carbon beds)	APC-2013/0083; Issued 4/16/2014	8162							1.256	
SD-1 Micro (before carbon beds)	APC-2013/0083; Issued 4/16/2014	8162							2.649	
MP-1 (before carbon beds)	APC-2013/0083; Issued 4/16/2014	8162							2.67	
R&D Support/Maintenance - Cold Solvent Degreaser ⁽⁵⁾	APC-2015/0081-Construction/Operation (VOC RACT)	8165							2.37	
Gasoline Dispensing	Exempt								0.44	
Four Registered Dust Collector	Registration	B8136	To be added							
Buchi Spray Dryer	Registration	B8162A							0.272	
TOTAL EMISSIONS =				1.30	1.08	0.00	8.18	8.24	0.44	23.60

Notes:

- (1) The Potential To Emit (PTE) for the boilers is based on the manufacturers or AP-42 emission factors (Stack Test results were below manufacturer's detection limit)
- (2) PTE is based on 8760 hours after baghouse (federally enforceable)
- (3) There are no emission limits for HAPs in these permits. PTE is based on historical maximum chemical quantity using Department accepted methods.
- (4) PTE is based on manufacturers run rate information, fixed solvent list and associated properties, inherent restricted hours due to equipment type.
- (5) PTE is based on AP-42 emission calculations for degreasing operations and SK Model 250 degreaser specifications
- (6) These compounds are listed HAPs.
- (7) Assume benzene, toluene, ethyl benzene and xylene make up 1% each of the total VOC emissions.